

AMATEUR RADIO

MAY
1946

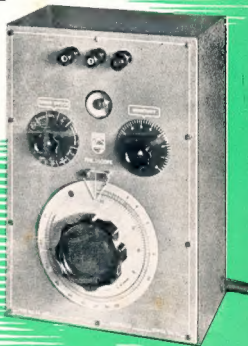
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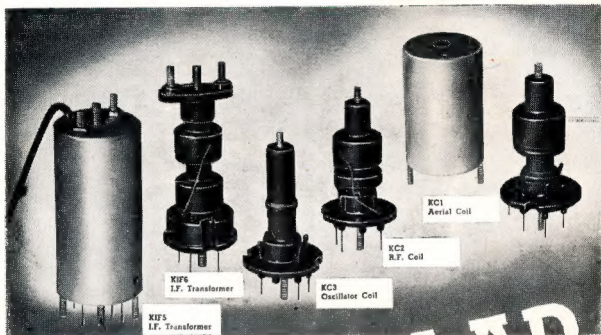
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Editorial

There is no doubt that personal contact is the only sure means of promoting a full understanding of one another's problems.

The Federal Convention of the Wireless Institute of Australia held in Melbourne during Easter proved this fact. Delegates from all States were present and in spite of the diversified opinions held by the various Divisions, the atmosphere which dominated the Convention was one of friendliness.

Not only did friendliness prevail, but what was more important, each Delegate came to the conference table with a spirit of give and take—each Delegate was prepared to see the others point of view, and endeavour to modify his, so that an unanimous decision could be reached.

This is the true Ham attitude, of what we are proud—for it was apparent that all Delegates had come to the Convention with the obvious intention of reaching decisions for the improvement, not only of our own organisation, but that of Amateur Radio generally.

It is evident from the discussions and decisions that the Convention has been the most important in the history of the Wireless Institute of Australia, for the Convention proved beyond doubt that the Institute to-day stands united.

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RECTIFIERS

By F. P. Dickson (VK2FB)*

PART II. Gasfilled Rectifiers.

We noticed that in high vacuum rectifiers the presence of gas is fatal. That is because of the nature of the gases released by overheating, whereas in gasfilled rectifiers we use inert gases, such as argon, helium or mercury vapour. These do not attack the cathode chemically and the emission is not destroyed. Moreover, we choose advantageous gas pressures.

In order to understand clearly the nature of the arc discharge in gasfilled tubes we must first have some idea of the various kinds of discharge in gases at low pressure. Let us consider a bulb filled with inert gas at a suitable pressure, say 5 mm. of mercury (atmospheric pressure is 760 mm. mercury) with two electrodes connected to a source of voltage. This is essentially the same set-up as a neon tube.

the atoms by collision, whereupon the number of ions and electrons increases rapidly. Once ignition has started, it can be maintained at a lower voltage because of secondary ionisation. The cathode glows with a colour depending on the nature of the gas and its purity.

This stage is called glow discharge and in the region where its characteristic is horizontal is the condition of operation of voltage regulator tubes, which persists until the electrode is completely covered with glow. See Fig. 3. (2).

Both when the characteristic is negative and horizontal, a stable current can only be maintained by external impedance.

Once the glow entirely covers the cathode a new set of conditions follow and the current voltage characteristic is again positive, the voltage having to be increased to cause greater current flow.

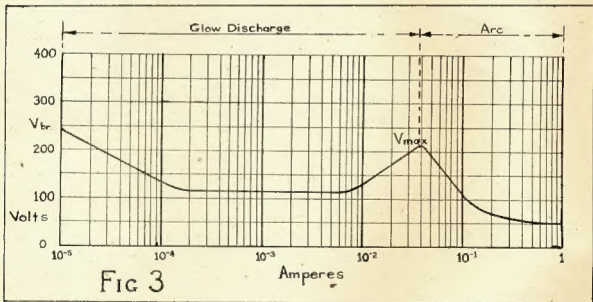


FIG 3

When an increasing voltage is applied a series of phenomena takes place. At a voltage called the "break-down" voltage the gas becomes ionised. An ion is an atom, which has had an electron removed and so is positively charged.

In the gas a few ions and electrons are always to be found and the applied voltage attracts these to negative and positive plates respectively. When the voltage is high enough they move at sufficient velocities to ionise

In the same way as the anode is heated by the electrons it collects, the cathode is heated by the positive ions attracted to it and there neutralised. With sufficient ion speed, due to the applied voltage, the cathode becomes hot enough to emit electrons. Once a copious supply of electrons is obtained an arc discharge takes place. The characteristic becomes again sharply negative and in the absence of current limiting impedance, the tube will be destroyed by excessive current. A fraction of the electrons emitted collide with gas atoms and produce ions, which keep the cathode hot by bombardment and prevent the formation of a space charge by largely neutralising

*Transmitting Valve Department
Philips Electrical Industries of Australia.

§Part I. see "Amateur Radio," March 1st, 1946,

(2) Ref. Mulder loc. cit.

the electron cloud. In the absence of space charge, substantially the whole of the anode voltage is effective in attracting the electrons and thus the internal impedance of the tube is very low and only sufficient voltage need be applied to maintain ionisation of the particular gas used.

Ions arriving at the cathode with sufficient velocity will knock atoms out of its surface. This process is called "cathode sputtering" and the cathode is gradually eaten away. A good example of this is the gradual darkening of neon lamp bulbs, the glass becoming coated with material dislodged from the cathode. This process also causes cleaning up of the gas, molecules of which are bound down by absorption in the deposited material. This, rather than loss of cathode substance, is what determines the life of a tube filled with a permanent gas. The so-called rare gases are used, since these are chemically inert to the substances in the tube, but none the less by absorption the supply ultimately fails. We can in certain cases escape this by using mercury vapour, which at normal temperatures is evaporated from liquid mercury at a suitable pressure for arc discharges, and sufficient of the liquid can easily be used to last the life of the tube.

To make a rectifier, we must arrange matters so that the arc takes place in the one direction only. It is clear that with the tube described, if A.C. were applied the two elements would be alternately anode and cathode and there would be no rectification.

If we make one of our electrodes a cathode externally heated and with large emission, while the other is an anode kept relatively cool, there will, with positive anode, be no glow discharge, but as soon as the striking voltage is reached, at which the gas ionises, the arc sets in.

In practical rectifiers, with very few exceptions, oxide cathodes are used because of their large emission and consequent economy of heating power. In a gas atmosphere more heat is lost than in vacuum because of the gas, the molecules of which conduct it away. Extra heating, however, is derived from the arc by bombardment. Actually, once started a mercury vapour tube will run with the filament current shut off, but this is very bad practice as the arc which maintains the heat keeps only a small part of the cathode hot and this is consequently overloaded, which shortens its life.

Since there is no space charge to repel electrons seeking to come out of the cathode, we can have our cathode in a complicated shape, such as a close coiled spiral to conserve heat without any difficulties about emitting surface facing the anode. The portions inside the spiral contribute their share to the emission. In this way we obtain far higher emission per watt of filament power than in high vacuum tubes. The figure may be as high as 1 amp. per watt. Expressed in another way, we are able greatly to increase the ratio of emitting to radiating surface, which in high vacuum valves is substantially unity. Also shields are fitted around the cathode to reflect back the heat which is radiated.

The value of our study of gas discharges becomes apparent when we come to consider the inverse ratings of gas-filled rectifiers; when the anode becomes negative it is then the cathode for a glow discharge. If it becomes so hot that the critical temperature is reached at which the glow changes into an arc, we can no longer have rectification and by the passage of much A.C. our valve will be destroyed.

The use of special test anode enables this process to be observed and it takes place precisely according to the curve of Fig. 3. (3). In practice it is not possible to make a practically uniform anode in which there will not be local hot spots, nor to keep it perfectly free of material of low work function. The best results are obtained with anodes of graphite or metal anodes with carbon coating.

Because of the non-homogeneity of practical anodes we cannot accurately specify an inverse voltage at which an arc back will take place. Arc back voltage is, in fact, a very complicated function of electrodes, gas pressure, proximity and condition of the bulb walls, etc. We can, however, on a statistical basis, assign an inverse voltage such that the probability of an arc back is small compared with the life of the valve. If a portion of the anode can reach the critical temperature, the occurrence of an arc back is only a question of time. Over a wide range arc back voltage rises as the gas pressure falls, which is the reason why the inverse ratings of mercury rectifiers must be reduced at higher temperatures when the mercury vapour pressure increases. We cannot make the pressure too low, however, as the forward striking and operating voltages as well as the cathode life will suffer and the matter becomes one of compromise. In rectifiers for very high voltages various other precautions can be taken to hinder the formation of glow discharge and to delay its change into an arc, such as the development of special bulb forms and shielding pieces. These, however, are hardly the concern of amateur stations who do not require 10 to 20 thousand volt supplies.

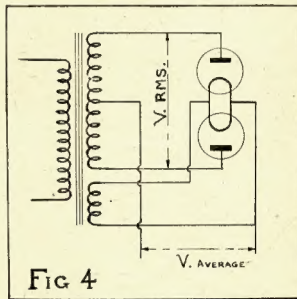


FIG 4

V average	=	0.450 x V RMS
	=	0.318 x V peak
V inverse	=	3.14 x V average
I average	=	0.636 x I peak
Ripple frequency	=	2 x mains frequency
Ripple voltage	=	48.3%
Ratio — Secondary volt amperes	=	1.57
Ratio — D.C. output watts.		
Ratio — Primary volt amperes	=	1.11
Ratio — D.C. output watts.		

Assuming constant output current.

These figures are also applicable to high vacuum rectifiers, but the voltage drop in the valve is quite a different matter.

"CLEARING THE ETHER, SERIES II"

By G. Glover, VK3AG*

This series of articles is intended to serve as a guide for Prospective, New and Old Hams alike.

INTRODUCTION.

Some years ago the present author published a series of articles in "Q.T.C." under the title of "CLEARING THE ETHER," in which he dealt with the problems confronting—Prospective, New and Old Experimenters. It seems appropriate therefore, to name this series of articles "CLEARING THE ETHER SERIES II," for it covers the same ground as the original series; but is equipped with 1946 technique.

During the War many men and women answered the call to arms and many of them were trained to maintain the vast communication network necessary to keep contact with ships at sea, forces in the field and aircraft in flight. To-day these men and women represent potential "Hams"; because like the call of the sea, the "Key" or "Natter" bug has found its way into their blood stream.

We extend to them a cordial invitation to join us in "Hamdom," and the author personally hopes that these articles will help them through the transition period from "Founders of the King's Brass" and "Operators of Doovahs," to the exalted ranks of "Ham Ear-Bashers."

In preparing this treatise the author has taken into consideration human psychology; for instance, it would be inhuman to expect the enthusiastic beginner, whose thoughts and ambitions are concentrated on Transmitters, to wade through the Section on Frequency Meters first; so should the cart appear before the horse occasionally the reader will appreciate the reason.

Every branch of the subject touched will be dealt with under an appropriate heading, commencing with the Prospective Amateur or Student.

The author sincerely hopes that this treatise will meet with the same degree of success as its predecessor, which judging by readers comments was favourably received, and useful to at least some of his readers. He wishes to thank all those good people who have assisted in the compilation of matter for this treatise.

ADVICE TO THE PROSPECTIVE AMATEUR.

This subject will be dealt with under four headings, namely, (a) Theory; (b) Sending; (c) Receiving; (d) Code Practice Devices.

(a) **LEARNING THEORY.**—To commence with, the student could not do better than obtain a copy of the "Radio Amateur's Handbook," an instructive publication issued by the A.R.R.L. If the student does not fully comprehend all the explanations given, he should get in touch with someone who does, and obtain a satisfactory explanation. Never leave one single point undeciphered.

The student who is within easy reach of the Capital City in his State should contact the W.I.A. and enquire about the schedule for A.O.P.C. Classes being conducted. Perhaps if the number of inquiries from the Country warranted it, the Technical Committee of the W.I.A. would undertake the preparation of a "Correspondence Course." Just a suggestion fellows, think it over.

Just one word of warning to students before leaving the subject of theory—Never skip over a book. Firstly, read through the book quickly to get an insight into the subject being covered, and then re-read slowly. Peruse each page very carefully and give due consideration to each point. This is essential, for without laying a good foundation one can hardly expect the structure to withstand the pressure of additional floors. The moral is—look after the little points and the big ones will take care of themselves.

(b) **LEARNING TO SEND.**—It should be the aim of every student to become a perfect sender and as the great majority have no knowledge of this art, it is essential that they should exercise the greatest care and patience in the initial stages.

Wrist Action.—One of the greatest assets a sender can possess is a flexible wrist, since, upon the flexibility of his wrist depends his ultimate success as a sender. One great authority advocates the following method of obtaining the desired flexibility of the wrist, "Maintain the forearm in a limp position, waving the hand upwards and downwards with a movement similar to that usually employed when waving 'Goodbye.' After a few days of such practice, night and morning, the student will be agreeably surprised at the marked improvement in his wrist action." Having tried this method with great success, the writer recommends it to both student and old timer alike.

Holding the Key.—The correct method of gripping the key is one of the biggest factors controlling the ultimate quality of the student's sending. The sender should grasp the key lightly, but firmly. Sit squarely in front of the key, placing index and second fingers (curved) on top of the knob, the thumb maintaining an even pressure on the side of the knob in order to give the required balance. The student must, under all conditions, endeavor to maintain this attitude.

Operating the Key.—The arm should form a continuation of the key bar, with elbow reasonably close to the side and upper arm and shoulder practically rigid (flexed naturally). The elbow should be used for a pivot for the upward and downward movement, and should not sway to and fro. Make all the muscles of the arm and hand co-operate and co-ordinate, thereby doing their fair share of the work. Remember—Unless full muscular co-ordination is attained, perfect and tireless sending is impossible.

Memorizing the Code.—Before attempting to send, it is naturally essential that the characters of the code should be thoroughly committed to memory, therefore, the student must learn each and every letter, figure, punctuation and other sign.

Summary of rules to be observed is:—

SEND SLOWLY.

Listen carefully to your sending.

Always strive for accuracy, not speed.

Take care of spacing.

Do not send when the wrist is tired, as by so doing you will develop a heavy, sluggish style.

Be at all times a harsh critic of your own sending.

If the above rules are properly observed the student will soon become a first class sender. As regards slow sending, it must be remembered that it will be some time before the wrist becomes properly accustomed to the peculiar movements necessary in telegraphy, and that in trying to force the pace, a very poor style will be developed. SEND SLOWLY at first, speed will come naturally.

Two types of apparatus, which will enable the student or sender to listen to his own sending, will be described later when discussing "Code Practice Devices." The remainder of the rules are self-explanatory, although it would not be out of place to mention in connection with spacing, that the duration of one dash is equal to that of three dots. The dot is the unit of sending, and all spaces and dashes are based upon it's length. The space between symbols forming part of a letter or character

is equal to one dot. The spacing between letters or figures, and words or groups, should represent the duration of three and five dots respectively.

The learner is strongly advised to leave the "Bug" or automatic key severely alone, until he has mastered the art of sending with the manual key. The sending speed, using the former type of key, is definitely fixed by the adjustment of weight on the dot making mechanism, and until the student is thoroughly familiar with sending technique and able to accurately judge spacing, he is liable to develop bad habits, which may prove to be beyond rectification at a later stage.

Listen to clean cut signals emitted by an automatic sending machine, then try to imitate it—above all, try assiduously to avoid slovenly style adopted by many Amateurs.

(b) **LEARNING TO RECEIVE.**—The usual method adopted in the classroom, is to enforce the rule "Learn to Receive before Attempting to Send"—under these conditions the Instructor is able to impress upon the student correct timing procedure and style; However, conditions are somewhat different when attempting to learn at home as an individual. The writer's experience has been that under these circumstances, it is better to reverse the procedure and learn to send properly before attempting to receive. The reason being, that while the student is sending, he is familiarizing himself with the characteristic cadence associated with each letter, and then, when he comes to receive he finds it much easier; because instead of listening to an unintelligible jumble of dots and dashes—he is able to recognise those letters and words which are frequently encountered. This demonstrates quite clearly how absolutely imperative it is for students to send correctly, otherwise they will have, as their first impressions, a wrong idea of the sound of a letter or word.

From the foregoing, it is apparent that it is necessary to seek the advice of a competent critic in the early stages of learning to send, or where such advice is not available, to try and faithfully interpret the timing of signals emitted by the automatic machine.

A summary of the rules to be observed is:—

RECEIVE AS FAST AS YOU CAN.

Study your writing—write freely—produce clean copy. Keep behind the sender, and watch punctuation marks.

"Receive as fast you can" is the golden rule when learning to receive—the converse of the rule "Send as slow as you can." The reason for this is that by listening to signals, which are just TOO fast for him, the student will find that by jotting down all the letters he can decipher, he will, by constant practice and concentration obtain solid copy at that speed. Note particularly that one should never wait to obtain a complete word before jotting anything down. As soon as the student finds himself capable of obtaining solid copy at a certain speed, he should immediately try to read higher speeds and so on, until he attains at least 20 to 25 words per minute. He is then able to negotiate the examination with confidence. The standards being 18 W.P.M. and 14 W.P.M. for First and Second Class Certificates respectively. The extra few words, per minute, suggested are necessary, for under the stress of examination conditions, when very few of us are really at our best, the 18 W.P.M. sent by the examiner will sound like twenty-five or more. Something must be left as a safety margin.

In regard to writing, it is pointed out that good writing is most essential and the student must see that each word or group he writes is legible. The more flourishes the student introduces into his writing, the greater the distance his hand must travel, and the slower will be the actual progress; therefore write clearly and without flourishes or ornamentation. Cross "t's" and dot "i's."

By keeping a few words behind the sender it will be found easier to write freely, since by keeping right on top of the sender one must write ever so much faster and make the same pauses between words, etc., as the sender; Whereas by keeping behind one can write steadily and so reduce the actual speed of writing and yet achieve the same result. One is also able by this means, to insert punctuation marks and guard against any errors made by the sender, thereby achieving our last objective, that of clean copy.

Obtaining practice is most important, and the student should seek the assistance of an Amateur or Commercial Operator with a good "fist." Should this not be practicable, then resort to the high frequency channels, where good practice may be obtained from both Amateurs and Commercial, particularly the Automatic Commercial Stations. Even though this be at twenty words per minute or more. At first it will be too fast for the learner, but by concentration it will soon be found to be within his capabilities. It is advisable to concentrate on those stations which send cipher and code, for since the matter cannot be deciphered there is not the same tendency to "guess" ahead of the sender, which is a bad practice and one which actually reduces the effective receiving speed. Remember above all, **RECEIVE AS FAST AS YOU CAN**, concentrate hard and practice often. There is no short cut and only constant practice brings the desired result.

(d) **CODE PRACTICE DEVICES.**—This section would not be complete without a short description of some type of apparatus suitable for code reception and sending practice. Figures 1a and 1b depict two types of apparatus which meet these requirements. They are:—(a) Thermionic Audio Frequency Oscillator and (b) Buzzer A.F. Oscillator.

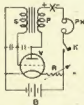


FIG 1A

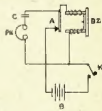


FIG 1B

The Thermionic A.F. Oscillator.—As shown in the diagram, consists of a tube, A.F. Transformer, battery, phones and key. Its operation is as follows. When the key (K) is pressed a surge of current through the primary (P) of the A.F. Transformer induces a current in the secondary (S) of the transformer, thus setting up a state of continuous oscillation in the whole circuit, which owing to the large inductance of the transformer, occurs at low frequency and is audible in the phones (PH). Thus,

(Continued on Page 21.)

DIRECT DISC RECORDING

*Part II.: The Turntable and Driving Gear

GEAR.

(Based on a lecture recently delivered to the Sound Recording Institute of Australia, by Mr. R. Kinley.)

One of the first selections which will need to be made by the prospective recordist, is that of a motor-driven turntable and the associated gear, which will cause the cutting or recording head to move across the recording disc and generate the well-known spiral track. These items together form what is essentially an engineer's lathe with a few modifications, and the future success of the machine is obviously bound up with the care with which the selection of the units is made. The purpose of this article is to outline some of the more important characteristics which should be met when choosing such equipment.

Generally speaking, the average gramophone motor, which is normally available for reproduction purposes, is quite unsuited for the purpose of recording. Their construction is rarely robust enough to withstand the additional strains and loads imposed by the cutting head and traversing gear, and they are not as a rule designed for long and continuous service such as may be demanded by the recording of a lengthy radio programme. Furthermore, the important feature of constancy of speed under varying line voltage and changing loads is unlikely to be met.

The latter criterion is most important in both the recording and reproducing of records, and a few remarks on the subject might not be out of place. Speed variations will result in a change of pitch as compared with the original sounds, and if these are of a fluctuating nature, a condition known to recordists as "wow" is set up, with disastrous results to the quality of the recording. A good musical ear can detect a change of pitch of about 0.3 per cent., so that in designing equipment it is usual to strive for a variation which is less than this amount.

Stability of speed can be largely ensured by the use of a massive turntable, and it is interesting to note that some of the commercial machines err on the side of safety, by incorporating tables weighing up to 110 lbs. Such a figure need not be sought for amateur recording purposes, and something in the range of 10 to 15 lbs. for a 12 in. diameter table should prove to be sufficient. In considering this question of weight, it must be borne in mind that it is not mass alone which is important, but moment of inertia, so that a turntable having its mass largely concentrated at its rim, is far more efficient as a constant-speed device, than one having the same mass, but of uniform thickness throughout.

It is not out of place at this juncture to mention the need for the turntable to run true, both in the vertical and horizontal directions. Eccentricity in either case can be readily detected if viewed relative to some point fixed to the baseboard on which the unit is mounted, or by the use of a dial indicator. Vertical movement will cause trouble by promoting alternate deep and shallow grooves when recording, and a further effect is to cause changes in pitch, even though the speed of rotation may be constant. Eccentricity in the horizontal plane will throw heavy lateral loads on the bearings, and will also bring about speed variations unless careful balancing is carried out before assembly. To check the balance of a turntable, it is necessary to remove it from the remainder of the motor, complete with spindle and any gearing, etc.,

which may be integral with it, and lay it with its axis horizontal on a pair of carefully-levelled knife edges. A well balanced assembly will exhibit no tendency to return to its original position, after being displaced slightly by rolling along the knife edges. If there is any out of balance, however, the excess weight will seek the lowest level, and a plumb-line hung from the spindle will show where it is located. The excess can be progressively removed by judicious drilling away of metal, with frequent rechecking to ensure that too much is not removed. When truly balanced, the assembly will remain stationary on the knife edges in any position it may be placed.

Bearings in which the system turns are also of importance, as these must be sufficiently tight to prevent any horizontal movement, and at the same time sufficiently loose to avoid imposing any undue retarding force on the motor. Since the speeds of rotation are low, plain brass or bronze bearings are quite satisfactory, and no recourse to ball or roller bearings is necessary. Indeed, a faulty ball or roller bearing can produce serious trouble in the form of vibration. Plain journal bearings, however, should be adequately proportioned to carry the side thrust imposed by the weight of the cutting head, when at the outer edge of the disc. In like manner, means should be provided for taking the vertical weight of the system by a suitable thrust bearing. A common method of so doing, is to sit the vertical spindle on a steel ball, as this sets up less friction than would machined thrust faces, and is less easily damaged.

Having thus reviewed the turntable requirements, the next question to consider is the provision of motive power to it. A variety of ways of doing this has been developed by different manufacturers, and each has to be considered on its merits. They fall into two broad classes, viz., those which drive from the spindle, and those which drive from the rim; although one intermediate type is known to the writer in which the drive is imparted midway between the two. In all instances except the last, it is usual for the electric motor itself to operate at a speed considerably higher than that of the turntable, and some form of speed reduction is therefore necessary.

Dealing with the first class, in which the drive is through the centre spindle, we find the use of gear reduction is largely adopted in one way or another. A feature of gear reduction, however, is that unless extremely fine precision is applied to the manufacture of the various parts, there is likelihood of minute variations in speed being imparted to the turntable by small irregularities of the various gear teeth. This results in what is often spoken of as "gear hum," and its presence is likely to be found in the final recording unless means are provided to filter it out. One method of so doing, is to introduce some form of resilience in the mechanism which can serve to absorb the variations, such as a felt or rubber coupling to the turntable. Another method of a more refined nature might be the use of an oil-damped resilient coupling, or a "fluid flywheel," although price considerations usually place these beyond the means of the amateur recordist.

Since the likelihood of developing "gear hum" increases with the number of gears used, it is usual to obtain the desired speed reduction with the minimum number of gears. One scheme is to introduce a Planetary drive where steel balls transmit the motion between shafts of different diameters. Such an arrangement is capable of giving satisfactory reduction ratios, but must be well-constructed to give good results, since poor workmanship or materials will soon give rise to trouble of a similar

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nature to "gear hum," through the development of slackness of the component parts.

A more common method is to use a worm-gear reduction, which can practically reach the desired speed in one stage, but here again precise workmanship must be incorporated if satisfactory operation is to be obtained. Adjustment must be provided between the worm wheel and driven pinion to reduce the slackness to a minimum, and there should be no end-play of the worm shaft. The tangential velocity of the worm past the pinion teeth is likely to be high, and any small surface irregularities will give rise to "gear hum." For this reason, the driven gear is often made of fibre or some soft material, which will readily become lapped to a smooth finish, but this may introduce a further difficulty in that rapid wear will take place, and considerable slackness or "backlash" will become apparent after some use. It is essential that good lubrication be provided for worm-gear reduction units, preferably by housing in an oil-bath.

Although the foregoing remarks appear pessimistic towards gear reduction units, it must be emphasized that they are intended to point out likely faults only. There are in service to-day many units of this type, which are proving entirely satisfactory. The enquiring recordist is urged to examine any such unit for quality in design and workmanship, using the above remarks as a guide in framing his opinion.

The second type of drive in which the turntable is driven from the rim is becoming increasingly popular because of its greater simplicity and fewer sources of trouble. The first of these uses an endless silk or cotton belt running in a groove cut in the turntable rim and a V-pulley on the motor drive. The belt is usually specially woven so that no join is apparent, as this would produce a "whip" in passing round the pulleys. It is similar in character to the cord employed on modern dental drills. Owing to the need for the belt to be in contact with a sufficient length of each pulley so that slipping will not occur, the amount of speed reduction is limited, and it is usual therefore to have two such reduction stages in series, or to provide some auxiliary form of gear reduction. Provided that the belt tension is not too great and the turntable mass is sufficiently large, there is little chance of gear hum being transmitted. The use of belt drives of any great length between pulley centres, should be confined to the slower moving portions of the reduction system, as they tend to "flap" and introduce speed irregularities if running too fast. Provision for adjusting the belt tension should be made, and where possible, guards should be placed to prevent contact with objects likely to cause stretching or abrasion of the belts.

A form of rim drive which is enjoying increased popularity of recent years is the use of a rubber-faced idler wheel in contact with both the motor spindle and the turntable rim. It should be noted that the size of the idler wheel does not effect the reduction ratio unless it is deformed by contact with one or other of the moving elements. The reduction ratio is governed entirely by the diameters of motor spindle and turntable rim, and in inverse proportion thereto. The idler wheel must run true on its bush, and should be spring-loaded in contact with the turntable rim and motor spindle. For dual-speed units, an alternate idler wheel is arranged to bear on a larger diameter of the motor spindle for the higher speed. It is essential that the motor be resiliently mounted on springs or rubber to reduce vibrations being transmitted to the turntable. Provision should also be made to release the idler wheels from contact with the spindle and rim when not in use, to prevent the formation of "flats" on its circumference. A variation of this design is to arrange for the motor spindle to bear directly on the turntable rim, without any intermediate "idler" wheel. The rim has a rubber face inset on its periphery. The general considerations, however, are the same as outlined above.

Mention should now be made of the electric motors to be used in any of the above applications. These are usually of the 6 or 4-pole type, having speeds between 950 and 1500 r.p.m., and power ratings from 50 to 100 watts. The need for constant speed under varying loads, rules out most of the types which are available. Strictly speaking, the synchronous motor is the only choice which will guarantee the fulfilment of this requirement, although many successful units have been making use of the squirrel-cage type of induction motor. The two are very alike in many respects, and it is interesting to note that the squirrel-cage type can be made to run synchronously by grinding the rotor circumference so that salient poles are formed to match the stator poles. The overload characteristic of the motor are reduced somewhat by this method if synchronous speed is to be maintained, but this can be overcome by using a motor of somewhat larger size in the first place.

The use of series motors, even if governor-controlled is not recommended, as they are too sensitive to both load and voltage fluctuations. Governors are rarely capable of exerting sufficient control of speed for recording purposes, and in any case require some change of speed to take place before they can operate. It is best to depend on a heavy turntable and a fairly constant-speed motor.

If a squirrel-cage or synchronous motor is to be used, care must be taken that the speed reduction ratio is correct to give the desired turntable speed. It is not sufficient to run a turntable at approximately 78 r.p.m., because on playback, the record must rotate at exactly the same speed as when it was cut. The majority of home-recording enthusiasts will probably use the same turntable for playback as for recording, in which case no great trouble is likely, but if discs are to be played elsewhere, it is necessary that this requirement be fulfilled. The use of a stroboscope is a convenient method of ensuring that the speed is correct.

It was mentioned earlier that a recording motor of a third type was known to the writer, in which the driving power was imparted to the turntable midway along its radius. It is of overseas manufacture and available in either the recording or playback types, and its design fulfils many of the desirable qualities mentioned earlier. It consists of two main parts—a stator carrying the windings, and a motor which is integral with the turntable itself. The stator is so constructed that alternate "teeth" are formed from the upper and lower cheeks of a steel bobbin in which the windings lie, and these are bent at right angles at the outer edge. This arrangement results in the formation of alternate north and south poles when the windings are energised. The rotor carries a number of permanent magnets laid radially with alternate north and south poles projecting inwards, and in close proximity to the stator "teeth." The unit requires starting by hand, but thenceforth continues to turn at such a speed that any given magnet passes from one stator tooth to the next in 0.01 seconds, or the time for the reverse alternation of current in the stator windings. The unit is therefore truly synchronous in character, and the turntable being made massive, it maintains a high degree of speed uniformity. The stator is resiliently-mounted to the motor board, and can rotate about the axis to a small degree, and this provides a means of absorbing any tendency towards vibration as the poles pass each other. The compact nature of the unit makes it eminently suited for outfits intended for portable use.



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PROPAGATION PREDICTIONS FOR MAY

(See Book Review on page 10)

Zone E. Latitude 10 deg. South.—(Northern Queensland, Northern Territory, Northern West Australia.) For the 28mC band.

Conditions show that 28mC becomes effective for skip distance is increased to 2500 miles. (Point of reflection of reflection, after which from 0900 to 1800, the skip distance is increased to 250 miles. (Point of reflection must be in E zone between 5 deg. S. and 15 deg. S.)

Zone E. Latitude 20 deg. South.—(Southern Queensland, New South Wales, South Australia, Western Australia.) For the 28mC band.

28mC usable for skip distances of 2500 miles between hours 0900 and 1800 local time, at point of reflection, which must be in zone E between latitudes 15 deg. S. and 25 deg. S.

Zone E. Latitude 30 deg. South.—(Victoria, Southern New South Wales, Southern South Australia, Southern West Australia.) For the 28mC band.

28mC is given here as the maximum useable frequency, and not, as in the previous two cases the optimum working frequency. Under these conditions it seems that communications on this frequency may not be reliable, and may be dependant on local conditions. 28mC is given as the maximum useable frequency between the hours of 0930 and 1800 local time, at point of reflection, which must be between latitude 25 deg. S. and 35 deg. S.

Zone E. Latitude 40 deg. South.—(Tasmania).

28mC does not appear to be suitable for long distance work in this zone, as the maximum useable frequency is given as 25mC and even then this condition is sharply peaked between the hours of 1100 and 1400 local time. However, it is pointed out that these conditions may be varied from day to day.

PHILIPS, BRISBANE, CHANGE ADDRESS

It is almost four years since the R.A.A.F. and Philips Brisbane Office passed each other, so to speak, on the steps of Reid House, 148 Edward Street, the Air Force was moving in, and Philips were moving out to temporary quarters.

However, we now learn that the situation is reversed, and when renovations are complete, the Philips Branch will be functioning in its familiar pre-war premises at Reid House.

A.O.C.P. CLASSES

The Victorian Division A.O.C.P. Classes commenced on Monday, April 29. Lectures are held Monday and Thursday Nights, 8-10 p.m.

The Course runs for a period of 5 months and Tuition is given in radio theory, morse code and regulations. A limited number of vacancies still exist in the first class. Contact Class manager on either of above nights at FJ 6997.

IN REVIEW

TECHNICAL BOOKS - - - - - RECORDINGS - - - - - PRODUCTS

BOOKS

RADIO PROPAGATION BULLETINS.

Published by the Australian Radio Propagation Committee of the Radio Research Board of the Council for Scientific and Industrial Research, and prepared at the Laboratory of the Radio Research Board, University of Sydney.

In an endeavor to make a scientific study of Ionospheric conditions and their effects upon radio communications, and to co-ordinate all available data for the general use of all bodies interested in the science of radio communications, the Radio Research Board of the Council for Scientific and Industrial Research has been set up.

Working in co-operation with similar bodies throughout the world, the Board is able to issue monthly 'I's Radio Propagation Bulletins.

From its long range study of Ionospheric conditions, the Board is able to predict with some degree of accuracy, just what conditions are likely to influence radio communications for a considerable period ahead, and to recommend the most suitable frequencies for reliable communication over specified distances.

The monthly "Radio Propagation Bulletins" are issued on the 15th of the month prior to that for which the predictions are made. These Bulletins contain the following information:—

- (a) World map divided into zones E, I and W.
- (b) Great circle chart of world centered on the equator.
- (c) Charts showing world contours of maximum useable frequencies.
- (d) Charts of Maximum useable frequencies for the three zones for the following month.
- (e) Conversion scale for obtaining Optimum working frequency from maximum useable frequency.
- (f) A transparent working sheet for use in calculating multi-hop paths.
- (g) Skip distance working sheet.
- (h) An analysis of conditions and accuracy of forecasts for the period prior to the issue of the Bulletin.

A handbook for use with the bulletins, ARPC-H1 is available and full information for the interpretation of monthly predictions is contained therein.

It is not practicable to publish any concise form of the contents of the bulletins, as much would be lost by so doing, but it may be possible to give a monthly review of conditions on the amateur bands.

For the serious minded Amateur, the study of these Bulletins is to be recommended as a means of obtaining reliable information about the conditions which govern his hobby. By so doing he will be ensuring reliability of operation, by choosing the most satisfactory operating frequency for the type of communication he is engaged upon. (When all Amateur frequencies are returned to their rightful owners).

The Handbook, for use with Radio Propagation Bulletins (ARPC-H1), price 1/-, and the monthly Radio Propagation Bulletins (May 1946 ARPC-A17), price 2/-, are available from all newsgroups and booksellers. Wholesale Distributors Gordon and Gotch (Australasia Limited).

Our copies by courtesy of the Radio Research Board.

TUBES.

PHILIPS TO RELEASE NEW VALVE TYPE.

News of a further addition to their range of valve types is announced by the Philips Organisation. The type is

known as the ECH-35, and the following details have been made available pending the release of the valve in about two months time.

Type ECH-35, is a frequency changer valve comprising a triode oscillator and hexode modulator on a common cathode—the triode being mounted vertically below the hexode part.

The signal is applied to the innermost grid of the hexode, which has variable mu properties and is connected to the top cap of the valve. The Oscillator grid is internally connected to the third (injector) grid of the hexode, which is isolated from signal grid and anode by the second and fourth grids, which are connected together and comprise the screen.

Type ECH-35 is particularly well suited for short wave operation, because of its high conversion conductance of 660 uA/V at full gain and remarkably low frequency drift: the latter remaining low when the valve is under A.V.C. control. Mains voltage fluctuations have also a small effect only, and when the oscillator tuned circuit is connected in the triode anode lead, a mains fluctuation of 10% will produce a frequency drift of less than 1 K.C. at 20 mc/s. The change in oscillator frequency on biasing the hexode to cut-off, is less than 3 K.C.'s at 20 mc/s. with a tuned circuit capacity of 50 uF.

In the hexode there is no electron coupling between the signal grid and the third grid, but there is, of course, a small capacity between them. The effect of this is, that at about 25 mc/s. an A.C. voltage of oscillator frequency and having an amplitude approximately 0.5V will appear at the signal grid. This, however, has but a small effect on the conversion slope, and as will be seen later, need not be detrimental.

The high conversion slope is obtained from the high slope of the hexode, from grid 1 to anode, and the sharp fall of this slope with increasing negative voltage on grid 3. This also means that only a low oscillator A.C. voltage is required, amounting to 8V R.M.S. for optimum performance. The conversion slope remains high over a wide range of oscillator voltage; at 5V it is approximately 580 uA/V and falls but slightly from the maximum value at double the optimum voltage. This wide tolerance simplifies the design for wide wave ranges, since a considerable change of oscillator output has little effect on the conversion slope and amplification.

The optimum value of 8V R.M.S. (200 uA in a grid leak of 50,000 ohms), represents the most favourable compromise between noise, heterodyne whistles and conversion gain.

APPLICATION DATA.

Due to the high slope of the triode, the starting and maintenance of oscillations will not present any difficulties and the feed-back coil may be rather loosely coupled.

The recommended value of grid leak is 50,000 ohms and the grid condenser 50 uF. These values are suitable for all wave ranges. To keep frequency drift to a minimum and to facilitate tracking of the oscillator, it is recommended to insert the tuned circuit in the anode side, and the feed-back coil in the grid circuit of the triode.

The A.C. voltage at oscillator frequency appearing at signal grid through the capacity to the third grid increases or reduces the conversion slope, according to whether the oscillator frequency is higher or lower than the signal frequency. It is therefore, better to operate the oscillator higher in frequency than the signal.

HAM SPECIALS

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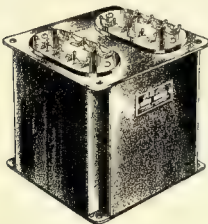
Crystal Holders

Airforce Type, as used in AT5AR8 Equipment. Bakelite case; size, 1 1/2" x 1 3/4" x 3/4". Will fit standard 5-pin socket and accommodate crystal 3/4" x 3/4".

3'6 -ea.

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TRIMAX UNIVERSAL MODULATION TRANSFORMERS.

From "Trimax," manufacturers of "ABAC" Transformers, comes this month news of their Universal Modulation Transformers Types TA907 and TA908. Designed so that practically every possible combination of RF power amplifier and AF modulator may be correctly matched, these transformers are ideal for Amateur requirements. Two sizes are at present being manufactured, TA907 which has

a 30 watt (Audio) rating, and is designed to carry a maximum of 200mA unbalanced DC in the secondary, and TA908 which carries a 100 watt audio rating with a maximum of 400mA unbalanced DC in the secondary. Frequency response of both types is stated to be from 50-8,000 cycles per second, whilst the ranges of primary and secondary loads are as follows:—Primary, 2,500 ohms—18,000 ohms. Secondary, 208 ohms—26,000 ohms. That care has been paid to the design of these units is evidenced by their weight, TA907 weighing 18 lbs., whilst TA908 weighs 40 lbs.

Further information may be had by writing to "Trimax" Transformers, Cliff & Bunting Pty. Ltd., Box 21, North Melbourne, N.I. Victoria, and asking for leaflet 46-1. Supplies at the present time are stated to be limited, although small batches of both types are being manufactured.

NEW DIAL

Aegis Manufacturing Company (see advt. on Back Cover) are marketing a new dial which has special application to those enthusiasts who build up their own modulated oscillators, UHF Converters, Communication type receivers and special measuring gear.

The dial has a large knob as well as a small vernier knob with rubber cushioned drive. The main dial, about six inches in diameter is calibrated and the calibrations are read off through a hair-line engraved on a Perspex panel which overhangs the main dial scale.

FEDERAL HEADQUARTERS

The Sixteenth Federal Convention of the Wireless Institute of Australia was held during Easter, 19th-22nd April, in Melbourne. Delegates were present from all States and were:—

New South Wales, J. B. Corbin, VK2YC; Victoria, J. G. Marsland, VK3NY; Queensland, F. Nolan, VK4JU; South Australia, E. A. Barbier, VK5MD; Western Australia, J. Squires, VK6JS; Tasmania, A. Morrisby.

Members of Federal Executive: Mr. R. J. Marriott, VK3SI, Federal President; Mr. A. H. Clyne, VK3VX, Federal Secretary; Mr. T. D. Hogan, Federal Treasurer; Mr. C. C. Quin, VK3WQ, Assistant Federal Secretary; and Mr. V. E. Marshall of Federal Executive were also present.

Mr. J. Moyle, VK2JU, attended as an Official observer for the New South Wales Division.

The Federal President, Mr. R. J. Marriott, opened the Convention on the Friday afternoon at 2.15 p.m., and expressed his hopes for the success of the Convention. Mr. V. E. Marshall on behalf of Federal Executive welcomed the Delegates, and expressed the feeling of deep satisfaction that every State of the Commonwealth and Division of the Wireless Institute of Australia was directly represented at the Convention.

Mr. E. A. Barbier (S.A.) replying to the welcome said, "I feel, and I think the rest of the Delegates do, that we have come here to improve Amateur Radio, and to improve our station, and we thank you for your welcome."

Mr. R. J. Marriott, VK3SI, was then appointed Chairman of the Convention.

ANNUAL REPORT OF THE WIRELESS INSTITUTE OF AUSTRALIA.

With the successful termination of the war of 1939-45, amateur radio comes into its own. The war has taken place since the last Federal Convention and has had a profound effect on the affairs of both the Institute and its members.

First, it cancelled all activity among amateurs. Second, it gradually put out of action the Divisions of South Australia, Queensland, Western Australia and Tasmania, and drastically curtailed the activities of New South Wales and Victoria. Finally and most important, it proved the members of the Wireless Institute to be citizens of great loyalty in their efforts to bring this war to a successful conclusion.

Wartime Activities.

The number of members who were in the Armed Services represented 47 per cent. of the total membership. This was a fine total for the Wireless Institute to have achieved. It also proved the value of the training and experience gained in the peacetime hobby of the amateur.

In addition to the Armed Services the remaining members formed and operated Emergency Communication Networks in New South Wales and South Australia, they also became instructors to Service aspirants in such bodies as the R.A.A.F., Air Training Corps and in the W.I.A. itself. Others again, pursued their jobs with great vigor in all branches of radio, producing gear for the Forces and maintaining the communication services.

Re-Activation of Interest in Amateur Radio.
Early in 1945, it became apparent to most that the war was drawing towards its end and some thought was given once more to the old hobby. With this in view the Federal Executive invited suggestions from Divisions and members regarding the re-establishment of Amateur Radio. During May 1945, a draft plan with various ideas incorporated was circulated amongst Divisions for comment. From this was drawn up the final plan which was

submitted later to the Chief Inspector, Wireless, for consideration. The regulations finally issued incorporated many of these ideas.

The circulation of this plan and the discussions which arose from it were responsible for the revival of the Divisions in South Australia, Queensland, Western Australia and Tasmania. The interest of members of all Divisions in re-establishing amateur radio was astounding. As a result, the membership of all Divisions is as high as ever. This is most gratifying to Federal Headquarters.

Magazine.

Federal Executive wish to acclaim the wonderful job done by the Victorian Division and the magazine committee in maintaining the magazine through the whole of war under the greatest of difficulties. "Amateur Radio" circulated amongst amateurs in the Services and at home and therefore contributed a great deal to hold the members together.

They are further to be congratulated on the excellent publication which recently commenced, namely, the printed magazine in a new form. We are sure this magazine will progress more than any previous one.

Postmaster General's Department.

Relations with the P.M.G. Department have been most cordial throughout the war. We feel that this augurs well for the future when so many alterations of regulations or frequencies may take place. During the year a number of visits have been made by Federal Executive to the Chief Radio Inspector and many communications have passed between the Executive and the Department.

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Radiotron type 807, although primarily designed as a transmitting valve, is equally suitable for use in receivers or audio frequency amplifiers. It may be used as a replacement for type 6L6 or 6L6-G either in single-ended or push-pull amplifiers. Its dissipation and voltage ratings are higher than those of type 6L6 so that its applications are more varied.

Radiotron

The licensing of amateurs commenced in December, 1945, and we wish to thank the P.M.G. Department for the expeditious manner in which this has been carried out.

Regulations.

The regulations issued which now control amateur radio differ in some ways from the pre-war regulations. The differences mainly concern the form of licensing and the standards of ability. These standards have been raised slightly above pre-war requirements, which the Federal Executive considers a desirable condition.

Frequencies.

The frequencies allotted to amateur experimental use to date are: 28-29 MC/S, 50-54 MC/S, 186-170 MC/S, 1345-1425 MC/S. The lower frequency pre-war bands are promised by the P.M.G. Department and are under consideration by them at the moment.

We believe all pre-war bands (with the possible exception of the 1.75 MC Band) will become available in the near future in the following order, 3.5 MC, 7 MC, and 14 MC with the possibility of a new band at 21 MC.

It will be seen therefore, that the progress made in re-establishing amateur radio is appreciable in the short time just past.

QSL Bureau.

The Bureau ceased to function during the war but it is now being revived and we hope will be in full swing before long.

I.A.R.U.

Federal Headquarters has maintained contact with the I.A.R.U. throughout the war and will continue even more so in the future.

Finance.

The Treasurer's Statement of Receipts and Expenditure

is attached. It will be observed that the financial position of the W.I.A. Federal Headquarters is quite sound.

Conclusion.

The new era of peace finds a greatly increased interest in Radio and its manifold uses.

It behoves us all as members of the Wireless Institute to take this opportunity and spare no effort to increase the scope and activities of the Institute making it a more powerful force and a bigger thing than it has ever been before.

On Saturday evening Victoria as Headquarters Division, and as such, hosts to the Delegates entertained the Visitors to a Dinner and Theatre Party. Mr. H. Kinnear, VK3KN, Victorian President, extended an invitation to visit his home for supper. It is perhaps needless to say that an excellent time was had by all.

Friday afternoon and evening, all day Saturday, Sunday morning and Monday morning, were times that Federal Council spent in considering the items of the Agenda and other business and Convention concluded at 1 p.m. on Monday.

DIRECT DISC RECORDING.

A final word should be added regarding the mounting of recording turntables before closing. It is essential that these be rigid and level, particularly for 33½ r.p.m. machines. Some of the best commercial units employ cast aluminium motor-boards with moulded stiffening ribs, and while this expense will not appeal to the average amateur, the moral should be kept in mind. A good 5 or 7 ply sheet with several stout stiffening ribs glued and screwed to the underside, and the whole mounted in a sturdy frame will ensure freedom from vibration, and give good results for most amateur work.

ON THE HIGHS

28-29 MEGACYCLES.

The DX enthusiast will appreciate the inclusion of these notes in the magazine. The intention is to provide month to month information of the DX coming through on the 28 Mc band. Contributions from individual members are welcomed as the information may be of interest to some other Amateur; his information may be of interest to you.

Hams operating on 50-54, and 166-170, and if any on 1345-1425 are also requested to send along their activities. Contributors are requested to have their copy in the hands of the Editor not later than the 18th of the month.

28 megacycles has once again come into its own, for excellent DX contacts have and are being made from all quarters of the globe. Many rare countries are coming through which will no doubt increase the number of applications for Worked All Continents Certificates and other awards.

XZ4AM situated at Rangoon, Burma, has been coming through on CW on 28-25 Mc while XZ2DF is on fone on a frequency of 28.1 Mc. XU1YW in North China is reasonably easy to contact. CR8AG at Macao, which is 48 miles West of Hong Kong, is old VS6AG of the 40 Metre days. He reports that the Nips took possession of all his gear during the war. He is now on the air with a completely new outfit. Others heard are ZS5BZ on CW and Fone; ZS3TW, ZS6DW on Fone; ZC2CU, ZS2AL, ZS6BV, ZS5CU all located in South Africa.

South America too is providing its share of DX contacts and from reports in VK3 the following stations have been QSO'ed. HK1AB; HC1JW; HC1PG is usually heard with R8 Fone on 28 Mc dead. PJ3X on CW is an easy contact usually on Saturday and Sunday morning about 8 a.m. This station operates just out of the band at the low frequency end. ZP2AC; CE1BE; LU4BC; PY2AC and CE1AO (a YL or XYL) can always be heard in VK3 with R8 Fone. Steve of HK4AX, on 28.100 is also easy to contact on Fone. Others are CE1AH, OA4AS, PY2NX, PY2AJ, HK3AB, PY1DS, LU7AZ with a terrific signal; LU9AX, and LU9EP.

From South America we travel to Central America, where KZ5AA, TG9AK, KAESH are to be found.

VQ 3TOM 28150 on Fone and CW is easy to contact. He is located in Central Africa. Others in the same part of the world are VQ6MS, VQ2PL and OQ6BQ. North Africa provides SU1CX, SU1USA, SU1MW is usually R8 Fone and this station reports that he is installing a pulsed UHF beamed signal with several kw input for tests with G6DH. FA8JD often heard from Algiers with good quality Fone.

A rare DX contact is provided by YI2XG, who operates from near Baghdad, Irak, using 16 watts input and his signal packs a kick.

Many G/I calls, that is G's operating in Italy, have been heard and the most consistent is that of G2CR/I and G6MO/I. VK3CP reports that the best Englishman heard by him is G3FJ on Fone, while his best European contacts have been PA0GN, GBUA, G2TA, F8WK, G8QB, ON4O, G5OQ. These contacts have been made with a bean antenna of the three element variety, and for those interested the following dimensions as found by cut and try, when exactly half wave dipole with a thermo galvanometer in the centre by VK3YP, should be helpful. 16 ft. 7 in. director; 33 ft. 11 ins. total for folded dipole fed by 72 ohm co-axial cable; 18 ft. 5 in. reflector. Both director and reflector have small stubs in these given lengths at their centres. 3 ft. 6 ins. spacing between Director and Dipole; 5 ft. 3 ins. between Dipole and Reflector. The Director's stub is shortened out giving 15 ft. 8 ins., which was all that was necessary to get a front-to-back ratio of 8:1 R points. For best tests VK3BW, Port Arlington, is only too willing to oblige, and he indicated that the

signal disappeared when the beam turned 20 degrees off head on position. VK3KX Colac also a good beam rotation test. Max Howden, VK3BQ, is also very pleased to help prospective rotary beam enthusiasts with rotating head mechanism.

In Tasmania, reports are that the DX are coming through consistently. VK7LJ worked a D2—sorry boys it was only a G7 operating with a D call. He and VK7CW also contacted a G6/L. VK7BJ wanted to be in on the contact, so having been given full directions went to work and after sorting out a weak signal way down in the bush, with some minutes of patient listening found that the signal came from a VK3 who had already forgotten his regulations. The ZL's are coming through in fine style in the "Apple Isle."

50-54 MEGACYCLES.

To date any calls mentioned in this section of the notes are from VK3 only, but it is hoped that active stations in other states will rally round and provide up-to-date information of their activity in this spectrum of the high frequency bands.

It seems that the Victorian Notes Correspondent made a "blue" in his notes in the April issue, when he referred to certain stations being active on 6 Mx. The calls in question are VK3MW and VK3BQ. The correct calls should be VK3NW and VK3TQ. It might be well to point out in defence of our Victorian Notes Correspondent, that the calls reported were noted down when called out at a Victorian Meeting. If the Correspondent mistakes a call under such circumstances it is up to the person holding the call to make sure that the letters of his call are distinctly heard.

The only calls reported to me (Editor) at present are VK3VH, VK3AFQ, VK3XA, VK3CO, VK3GG, VK3FT, VK3NR, VK3NW and VK3TQ.

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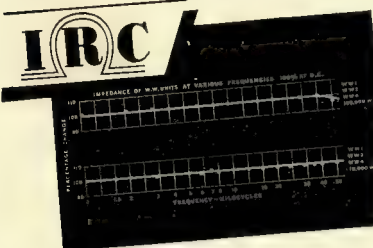
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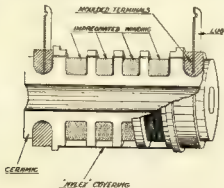
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The FCC has assigned channels to present commercial television licences, and licences of ten existing experimental television stations. All of the commercial assignments are for metropolitan stations with their existing powers and antenna heights.

Assignments were:—Channel 2, 54-80 Mc; Channel 13, 60-66 Mc; Channel 4, 66-72 Mc; Channel 5, 76-82 Mc.

Existing television stations that must change frequency will go off the air on or before March 1st, 1946, and return to the air with regular programs on or before July 1st, 1946.

Amateur service will change from the frequency space between 56 and 60 mc, to the space between 50 and 54 mc on March 1st, 1946.

Stations assigned channel 2 (54-60), may not begin operation before the 56-60 mc frequency space is vacated by the amateur service.



A crystal pickup cartridge with the crystal driven by a lever has been announced by Shure Brothers, Chicago.

Lower needle point impedance is said to be obtained. The lever arrangement is said to absorb the full impact of sudden jars to the cartridge or needle. Needle force of $\frac{1}{2}$ to 1½ ounce is attainable with the output voltage from 1.6 to over 3.

The cartridge is available in an all-minimum case, weight 0.48 ounce, and is also furnished in steel weighing 0.85 ounce.



The National Union Radio Corporation have developed a new miniature type (2½ in. bulb) half-wave full vacuum rectifier, type number NU 122. The tube can handle 20,000 volts, and in addition to its usual application as a half-wave rectifier at line frequencies, the tube is said to be suited for fly-back pulse rectifiers, and RF supplies for television circuits.



The National Union Radio Corporation of America claim "so fine is the texture of the special fluorescent material developed by National Union Research Laboratories, it is calculated that a 10 inch picture on the screen of a National Union cathode-ray tube is reproduced on 10 billion crystals!"

DIVISIONAL NOTES

NEW SOUTH WALES

Secretary: C. S. Higgins, VK2LO.

Box 1734 JJ G.P.O., Sydney.

Meeting Place: Science House, Gloucester and Essex Streets.

Meeting Night: Fourth Friday of each month.

The March General Meeting of the Division was held as usual on the fourth Friday in the Month and quite a representative gathering of members were present. Numbered among the visitors was Federal President Ron Marriott, VK3SI.

Members will regret to learn of the passing of Max Nunne, VK2NE. Max after a long spell of indifferent health went to meet the Great Brass pounder early in March. The Institute was represented at the funeral by Bill Zech, VK2ACF, whilst a minute's silence was observed prior to commencement of General Business at the March Meeting.

The Agenda for the Convention was discussed at length—quite a few items, particularly with reference to the Constitution and the Magazine—being debated at length. Mr. Jim Corbin, VK2YC, was elected Convention Delegate whilst Mr. J. Moyle, VK2JU, will also attend in an official capacity as Observer. This Division is particularly fortunate in having such capable representation.

The Division has donated the sum of £5/5/- to the Food for Britain Appeal and any Member willing to make a donation to this worthy cause should send any subscription to the Division and thus help swell the Institute total. Again why not send a hamper to any G that you have worked quite a few times either pre or post-war war. That

would be a QSL that would be very much appreciated. If you don't feel disposed to forward a complete parcel any donations of food—preferably tinned—may be left at a General Meeting and forwarded to British Centre. Inquiries are being made as to the possibilities of forwarding a shipment of food to the R.S.G.B. for distribution among English Amateurs.

The QSL Officer VK2YC suggests that members when designing their new cards endeavour to keep them a reasonable size—preferably Post Card size—so that they will fit the ordinary envelope. Again, large cards tend to become damaged during transit.

Owing to the time spent discussing Agenda Items it was not found possible for our Federal President to address the Meeting, but nevertheless his visit was much appreciated and this Division trusts that we will be able to see more of 3SI in the future.

Upon conclusion of General Business, supper was served and was much appreciated by all present.

Not much this month chaps as I feel sure that the Editor will have plenty of copy from the Convention.

Remember Monthly General Meetings are held on the fourth Friday of each Month and commence at 7.45 p.m.

VICTORIA

Secretary: R. A. C. Anderson, VK3WY.

Box 2611 W, G.P.O., Melbourne. WM 1579.

Meeting Place: Lecture Hall, Chamber of Manufacturers' Building, 312 Flinders Street, City.

Meeting Night: First Tuesday of each month.

Special Notice concerning subsequent meetings to take place on 1st Tuesday in each following month, 7th May, 11th June, etc.



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Until further notice the Victorian Division will conduct its monthly meetings in the Lecture Hall, Chamber of Manufacturer's Building, 312 Flinders Street, City.

By securing the above premises Council extend a hearty welcome to old faces, new and intending members and visitors and trust all will enjoy the extra comfort available by this departure.

The April Meeting was another bumper. The rooms as usual were packed with members and visitors and exceeded capacity.

Visitors from overseas and interstate included Albert Wilson of the U.S. Marine Corps, who is a commercial operator. Albert gave a stirring account of operating conditions on U.S. Ships in the Alaska waters and is fortunate to be with us owing to being on leave as 1st Wireless Officer aboard S.S. Yukon, which was wrecked, also present were VK's, 2TN, 7GR, Les Wealer.

3KN in the Chair welcomed visitors and was kept busy by the "Leftist's" with their suggestions regarding new frequencies. New meeting rooms and consequent comfort for large meetings and suggestions for the Easter Federal Conference.

During a discussion on Special Meetings, it was decided that the Secretary give special notice to members in the Public Notices column of Saturday's issue of "Age" newspaper as an expeditious means of notification owing to the long period between magazine issues. Members may be interested to learn that such a Special Meeting may be called at short notice, so keep yourself informed each Saturday.

The Chairman (VK3KN) commented on a luncheon rendezvous with Mr. F. S. Wood, Dave Medley, VK3MJ, Vaughan Marshall (VK3UK) and himself. Mr. Woods, as Senior Research Officer (late of Canberra), passed on some very helpful hints and suggestions which prompted

a very interesting lecture by 3UK and 3MJ on the why, how and result of ionospheric predictions as applied to radio communications, also the methods used in making predictions.

It is now notified that C.S.I.R. gives permission to republish all data concerning ionospheric predictions.

Dave Medley (VK3MJ) has accepted appointment as Convenor of Propagation Committee for the purpose of working with Council and in conjunction as a Sponsor to this science.

Members were bewildered at the meeting and a solution is still sought that will enable members to get to know or identify each other. Any suggestions? The meeting closed after a lively session of motions and suggestions for F.H.Q. and Convention delegates.

Don't forget, you will enjoy the next meeting and the extra comforts available justify a packed house (We don't mean passages).

The following members and visitors were present at the April meeting.

VK3s, HX, XD, EE, AV, QS, AHQ, MD, EA, NW, ED, MJ, MN, IV, UK, OC, HC, ET, CE, WQ, LX, DY, QE, PG, ABA, TE, ZU, LN, UM, ZC, AKL, AD, OJ, QP, NU, JI, CF, YJ, CG, JO, FS, SZ, PU, TU, JJ, UJ, CP, UH, OF, OT, YL, BQ, XA, IK, RM, WC, ZV, NN, LF, GU, ZB, AFQ, RT, AHM, XJ, CO, RN, ADX, EK, JD, QU, TF, LA, DM, WY.

K. C. Sneddon, H. Johnson, R. W. Viney, C. Arnold, R. L. West, R. Curnou, W. Mills, D. Jones, A. E. Fisher, T. N. Porter, J. Sloss, R. Morrison, G. W. Neilson, T. C. Hall, J. J. House, W. E. Welles, J. Moran, J. E. Groves, P. Symonds, K. Maroney, D. Burns, J. Matawa, W. A. Tetheradge, A. R. Lee, E. C. Barry, W. A. McLeod, and approximately eight other names that could not be read.

QUEENSLAND

Secretary: C. Marley, VK4CJ.

Box 638 J. G.P.O., Brisbane.

Meeting Place: State Service Building, Elizabeth St., City.

Meeting Night: First Friday of each month.

The venue of our meeting place being changed, our last General Meeting was held at the State Service Rooms, Elizabeth Street, City. It was our Annual Meeting and the good attendance elected the following office-bearers:—

4KS.—K. Schliecher returned as President.

4CJ.—C. Marley succeeds retiring Secretary 4ZU as Secretary.

4RC.—R. Campbell returned as Treasurer.

4ZU.—H. MacGregor elected Publicity Officer.

Council will comprise the following:—

President, 4KS; Secretary, 4CJ, and 4FY, 4HR, 4AW, 4ES, 4JU, and Mr. C. Reese as Student Representative. Personally we can't imagine a better team than that elected, so hold tight men. We're off!

The Convention Agenda was read out (and fully discussed with our delegate at a subsequent Council Meeting), and the job of selecting a delegate was then begun. Fortunately, 4JU was able to make the trip, as otherwise this State would have had to rely on a proxy. At the moment of writing Frank is on his way laden with our advice and hopes.

No doubt you fellows will say, "What! Again?" but the fact is that there's another change in meeting times. Owing to a better arrangement with the land-lord, we are now back to the old time, i.e., the last Friday in the Month, at the State Service Building. Council Meetings on the 2nd Friday in the month.

Student classes will be held on the other Fridays in the month as far as is possible.

That's a bit vague, so here is the dope. Considerable discussion took place re Student Classes, as the position regarding classes is not altogether satisfactory. After a comprehensive statement by Mr. P. Kelly, a pre-war Instructor, it was decided that it would be better to drop the class rather than continue as it was. However, 4FE offered to carry on for the time being, until we can obtain a paid instructor to run the classes on a purely commercial basis. Arthur was promised help by 4JU and 4CJ.

Several of the local gang will shortly be on 6MX, and in this connection we were wondering if any of the southern men (Jeeves, was that fellow's call 2LZ?) would be interested in directing their arrays at Brisbane and vice-versa. The thing would have to be done at specified periods of course, but it might prove interesting.

Some of the local gang are getting amongst the DX on 10MX, 4HR having worked 24 or 26 countries since coming back on the air. 4RC also lining them up and mowing 'em down. Our old friend Pat Kelly back with us again; was in Radar during the war.

4RY playing around with receivers, but like a lot of us doesn't get time to do much. We can't reveal his name, but one of the flock is seriously considering using fifteen or so frequencies simultaneously in order to snare that elusive DX. What will some of these fellows do next?

4KS has the beam working very nicely while 4ZU has the 6MX converter almost finished.

4HZ busy on an all-band TRF and a transmitter for 80 (if and when!). No AC as yet unfortunately (but also no power leaks—4ZU) 4LN. Still thinking of collecting his gear from the RI. Has some ideas and some T40 tubes. The ideas include rotary beams on 14MC—a hang-over from pre-war days. A VK3, Reg. Stevens is now living in Gympie and has some junk on the way up, but is a bit bothered about the antenna situation.

HAMS!

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We saved this one for last. 4KH has built himself another receiver.

The next Meeting of the Division will be held on Friday, May 31st, at 8 p.m.

SOUTH AUSTRALIA

Secretary: E. A. Barbier, VK5MD.

Box 1234 K. G.P.O., Adelaide.

Meeting Place: 17 Waymouth Street, Adelaide.

Meeting Night: Second Tuesday of each month.

At the General Meeting, held on Tuesday, 9th April, there was once more a record attendance, the total being 113. Several new members were enrolled, including some old "hams" returning to the "fold" and also some for the Student Classes. Membership is now 190.

The President, Mr. I. Thomas, VK5IT, was in the Chair, and after opening the Meeting, welcomed the visitors, who included Messrs. R. Short, VK4HF and R. R. Smith, VK3RY; also Bert Taylor, VK5AT; Don Taylor, VK5DX; and Bill Walker, VK5WW, who were resuming association with the Institute.

Mention was then made by the President to the late Mr. H. W. Harrington, Superintendent of Wireless, who had given great help and encouragement to the Amateurs of this State. A resolution was carried to convey to Mrs. Harrington and her daughters the deep sympathy of the Members of the Institute. The Meeting then stood in silence for one minute.

A lecture on "Radar" was given by Mr. (Sqrn. Ldr.) John Allan, VK5UL. A lot has been written on this subject of late and most of us, no doubt, had got a fair smattering of what it was all about without, perhaps, being able to fit all the bits and pieces together. In the course of his very informative lecture, Mr. Allan gave with the aid of chalk and blackboard, a most complete picture of the principles and apparatus involved. At the conclusion Mr. Pearn, VK5PN, expressed the feeling of the meeting in a vote of thanks which was carried in the usual way.

It was announced that Mr. Allan would interpret the Ionospheric Prediction Charts for us and that his observations for the ensuing week would be included in the Institute's Notes published each Saturday in the local newspaper. These predictions will become even more useful as we get our old bands back and have a choice of frequencies.

Several of the Student members who had earlier in the day sat for their "ticket," were at the Meeting, and Mr. Paris, supported by Mr. Wilkinson, expressed their thanks to the Instructors and the Institute for the excellent tuition received. Their remarks were responded to by Messrs. Buckerfield, VK5DA, and Roberts, VK5MY.

Owing to the Easter Holidays, the commencement of the next series of classes has been postponed and will now begin on Monday, 29th April. The course of twenty lectures will thus be completed in nice time for the October A.O.C.P. Examinations. Copies of the syllabus were distributed at the Meeting. Notes for each Lecture are also to be printed, thus saving time at the classes.

It has been reported that several Amateurs, in addition to their 28 m.c. signal, are also being received at good strength on 14 m.c. As this latter band is still taboo to us, it is asked that all those operating on 10 metres, particularly those who double in the final, check up on their transmissions to make sure they are also not radiating on 20 metres.

Council held a special meeting on 31st March to discuss the 87 items of the Federal Agenda and our representative to the Convention, Mr. Barbier, VK5MD, was thus well primed as to the views of this Division.

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To members of the W.I.A., on production of membership card, special discounts are available on all goods purchased. Interstate members forward your card and mailing address to ensure being placed on our lists. Membership Card will be sent back by return mail.

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As our usual room is not available for May, the next Meeting of the Institute will take the form of a picture night, kindly arranged by the Vacuum Oil Co., and will be held in the Institute Building, corner of Kintore Avenue and North Terrace, on Tuesday, 14th May.

TASMANIA

Secretary: J. Brown, VK7BJ,
12 Thirza Street, Newtown. 'Phone W 1328.
Meeting place, Photographic Society's Rooms,
162 Liverpool Street, Hobart.
Meeting Night: First Wednesday of each month.

This Division conducted its regular Council and General Meeting as usual. Council at 7.30 p.m. and General at 8 p.m. on the 3rd of March. Present were VK7LJ, President in the Chair, VK7's BJ, CJ, CW, and ML at the Council Meeting, with the addition of VK7's CT, AH, OM, AL, MG, CL, RV; Messrs. A. Morrisby and Koglin at the General Session. Apologies were received from VK7LL, VK7GT, VK7PA, VK7XA, Messrs. Gee and Neilson.

The main business of the evening was that of dealing with the sixty odd items of the Convention Agenda, and all un-necessary discussion had to be eliminated. In all, good time was made.

A motion, moved by VK7CW and seconded by VK7AL, "that the frequency 28-28.1 Mc be reserved for CW—operation as most DX was found in this part of the band" was carried, and all VK7 Amateurs are asked to observe this as a personal courtesy.

Other States asked to co-operate in this matter; Yes YYP, we'll have a kick at your tin! it seems that we are thinking your way in this matter.

Our delegate to represent VK7 at the Easter Convention is to be A. Morrisby, and although Alan is not a

licences Ham, he has been an Institute Member and an experimenter for years. This combined with his experience in Radio during the war should fit him for the job. VK7 has every confidence in his ability to conduct the Division's business at the Convention.

Jack Coulter, VK3MV, called on some of the lads while in port here recently (and was given a right royal time, from all reports.—ED.). Any Hams visiting VK7 are invited to do likewise as we are always glad to make acquaintances and renew old ones.

VK7LZ was seen recently in his home town, Launceston, after having spent some time in the services.

VK7PA has not found time to fire up the gear so far. Finds time taken up with hoe and paint brush at present. Has to revamp the RX for "Ten" when he does start.

VK7AL still struggling with a dual conversion super—1600-465 Kc. Better drop the 465 stage, Tom. Hi.

The Editorial note in "AR" of March re the ZL's on 3.5 Mc/s is very interesting. Let us hope that this and other old bands will be available in VK soon.

The next meeting of this Division will be held on Wednesday, June 5th, at the usual address and everyone is welcome.

RECTIFIERS.

We are now in a position to consider the operation of gas-filled rectifiers, and first comes a warning—never use a condenser input filter. Very large charging currents would flow into the condenser and the rectifier current pulses would approach or equal the saturated emission with a substantial increase in the rate of cathode sputtering, which at normal currents is low, and the life of the tube is thereby drastically shortened.

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The peak currents are also kept low by the use of full wave rectification as in high vacuum rectifiers and matters are still further improved by using three or more phases.

Mercury rectifiers can be used in voltage doubling systems in precisely the same way as high vacuum tubes, but as the extra filament transformers probably cost as much as a suitable high tension transformer, there is not much point in it for amateurs.

Parallel operation of these tubes calls for current limiting resistors in each anode lead as with low impedance high vacuum tubes, and has the additional advantage of lowering the current peaks.

It may sometimes be necessary to place high frequency chokes in series with gas-filled rectifier anodes, because the starting of the arc discharge is a transit phenomenon and may cause radio frequency disturbances similarly to a spark. In many cases the use of wire wound limiting resistors will serve for both functions.

In Fig. 4 we show a full wave rectifier with the table of current and voltage relationships, assuming zero tube drop. Actually for mercury vapour tubes this is nearly 16 volts, which figure should be taken into account if really accurate figures are desired. For most purposes it may be neglected.

CLEARING THE ETHER "SERIES II."

every time the key is pressed and released, characters of the morse code are formed. The frequency of the note heard in the phones may be varied within certain limits, by varying the rheostat (R) and/or shunting a small condenser of suitable value across the grid and plate of the valve, as shown in the diagram. The output may be increased by inserting a small battery, of from 1.5 to 9 volts, in the anode circuit at "X," with the positive and negative poles in the direction shown.

The Buzzer A.F. Oscillator.—Consists of a sparkling buzzer, an 0.01 F condenser, battery, phones and key. When the key (K) is pressed current flows through the windings of the buzzer (BZ), causing the cores of the windings to become magnetised and attract the iron armature piece A. This breaks the circuit causing cessation of current flow in the windings and allows the armature to return to its normal position, thereby restoring the continuity of the circuit. Rapid repetitions of this operation producing an audible note in the phones, due to the back E.M.F. generated in the buzzer windings discharging through the output circuit, and sparking at the breaker points. Thus, as in the previous type, characters of the morse code are formed during the manipulation of the key. The level of the signals may be varied to a certain extent by varying the capacity of the series coupling condenser C; whilst the frequency may be varied within reasonable limits by adjusting the buzzer mechanism and applied voltage.

NEW V.H.F. TRANSMITTING TRIODE EIMAC RELEASE NEW LIGHTHOUSE TUBE

The Eimac 3X100A11/2C39 (about time something was done to simplify this tube designation business.—Ed.) is a triode of the Lighthouse variety designed for a plate dissipation of 100 watts at frequencies of the order of 2500 Megacycles.

The extreme efficiency of the Lighthouse tubes at these high frequencies is brought about by their entirely revolutionary design.

By complete rearrangement of the elements and by use of microscopically close element spacing (cathode to grid 0.005 inches grid to plate 0.022 inches) Electron transit time is reduced to an absolute minimum.

CHARACTERISTICS TYPE 3X100A11/2C39 EIMAC TRIODE.

Electrical.

Cathode coated unipotential.	
Heater Voltage	6.3 volts.
Heater Current	1.1 amps.
Amplification Factor	(average) 100
Direct interelectrode capacitances	(average).
Grid to plate	1.95 uufd.
Grid to cathode	6.50 uufd.
Plate to cathode	0.030 uufd.
Transconductance (Ib 75 ma, Eb 600v)	20,000 umhos.
Maximum plate dissipation	100 watts.

Mechanical.

Maximum overall dimensions.	
Length	2.5 ins.
Diameter	1.26 ins.

This tube is of baseless construction, the connections to the elements being brought out to annular rings. The terminal arrangements are such that the tubes can be used in cavity circuits, whereby the elements become part of the circuit proper. The plate is fitted with a large radiating surface to ensure rapid heat dissipation.

I.F. REGENERATION.

Most hams know that a touch of regeneration in the I.F. stage of a Super Het receiver aids greatly in achieving something approaching "single-signal" reception.

Whilst being well below the effective selectivity of a crystal filter, it affords an easy method of getting just a little more pep from the receiver on crowded ham bands.

Here is a method of producing such regeneration which does not upset the normal operation of the I.F. channel.

In the suppressor lead of the I.F. tube (the first, if there are two) insert the coil from one side of an old I.F. transformer, grounding the other connection. Shielding is not necessary.

Across the coil place a .0001 variable condenser with panel control. This assembly can be mounted in any convenient spot reasonably close to the base of the I.F. tube. One of the fixed plates of the condenser can be bent so that the circuit is automatically shorted to ground when the plates are in full mesh.

With the condenser in operation, a point will be found where the I.F. tube oscillates. The I.F. gain should be backed off and the regeneration control tuned to the point one side of resonance where most gain is apparent. A little experience in the handling of this control will produce quite worth-while results.

—B. J. FAYLE, VK3IW

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Correspondents are requested to keep their letters short and to the point. The Editor reserves the right to delete anything he may think fit. The views expressed by correspondents are not necessarily those of the proprietors.

Melbourne.

Editor "AR".—

One other grouch is this—When is the column conducted by "The Old Man" (or whatever other name "he" chooses) going to make its appearance again? In 12 years of amateur radio I have never heard such rotten operating as can be heard at the present time. To quote only a few instances. A VK3 spluttering over one third of the band with over modulation says "Yes I know I'm over modulating but W-blub, blub, blub, said he could copy me better that way" or this VKXXX's carrier on for 6 minutes (timed) during hot DX period with a sotto voce conversation going on in the background between the announcement. Shades of "T.O.M.". Yes I know we have the RI's listening pulling us up, but there is nothing like putting a chap's call in the clear print in the Magazine to show him up.—Yours, etc.,

F. K. McTAGGART, VK3NW.

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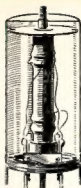
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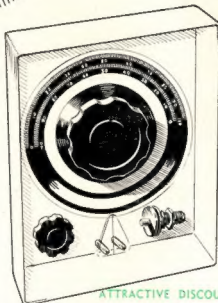


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